

Supplementary Table 1. Postcodes used to determine geographic locations

Geographic location	Postcodes
Central Australia*	0870, 0871, 0872, 0861, 0862, 0852, 4825, 5723, 6765, 6770, 6753, 6430, 6433, 6431
Non-Central Australia	All remaining participants, including those with missing postcode.

*Central Australia is often colloquially termed as the southern part of the Northern Territory (NT). In this paper, Central Australia includes not only the southern part of the NT, but is a larger geographic zone that overlaps state and territory boundary of South Australia, Western Australian and NT. It also extends to the Barkly region, and includes Lajamanu and Dagaragu communities, encompassing the service area of the Central Land Council. This wider region of Central Australia ensures that related and closely associated (through for example, kinship and language groups) Aboriginal and Torres Strait Islander groups are included in our analysis.

Supplementary Table 2: Variables used in the analysis

Covariates	
Gender	Derived from the question “What is your gender” Coded as (1) male, (2) female, (3) other, (.) missing. There were no persons identifying as “other” gender in Central Australian sample. The variable sex was used for all adjusted analyses: (1) male (2) female, (.) missing.
Age group	Age in years is calculated based on “date of entry” (i.e. date of completion of the survey) minus “date of birth”, rounded to one decimal place. Age group as a continuous variable is named age . Implausible values are recoded to “.” in the continuous variable. Age was re-categorised in age_cat into broader age categories: 16-34 years, 35-54 years, ≥ 55 years, to avoid small/zero cells.
Family financial status	Family financial status was derived from the question, “Which words best describe your family’s money situation?”. Responses included “we have a lot of savings” “we have some savings” “we have just enough to get us to the next payday” “we run out of money before payday” or “we are spending more than we get” “unsure”. These was recoded to: “run out of money or spend more than we get”(2), “just enough money”(1), “some or a lot of savings”(0).” Unsure will be included in missing.
Cultural determinants – Framed from work Waltja and used in Priest et al. (2008). 4 areas Kanyini (belonging, nurturing), Tjurkpa (law, dreaming), Ngura (country), Waltja (family and kin)	
Kanyini	
Community cohesion	Community cohesion was assessed using 7-item question asking: “In the Aboriginal and Torres Strait Islander community, where I live now...” with responses reflecting community-level cohesion: “there are people with cultural knowledge (bosses or elders) that I can go to or yarn with, there are places for people to meet; there are leaders; we cope with problems; we work together; Local Aboriginal/Torres Strait Islander people make community decisions; we respect the decisions made by our local community leaders”. Responses are “not at all” (1), “a little bit” (2), “a fair bit” (3), “a lot (4)”, “unsure (5)”. These were recoded to “not at all” (0), “a little bit” (1), “a fair bit” (2), “a lot (3)”, “unsure (missing = .)”. The total score was calculated by summing responses to all 7-items (range: 0 to 21) and was only created for participants with complete data across the items. The distribution of the sample was assessed to define low-medium and high categories. The categories were defined after assessing the centre of the data (histogram), mean =16, median = 17. This was then categorised into three categories: low (0-10), medium community cohesion (11-16) and high community cohesion (17-21).
Individual agency in the community	The question asked “in the community I live now:” and responses reflecting individual-level agency: “I can get involved in community discussions, I trust the leaders, I feel listened to, I feel respected. I feel like a role model, I feel like a leader, I feel like I belong.” Responses are “not at all” (1), “a little bit” (2), “a fair bit” (3), “a lot (4)”, “unsure (5)”. These were recoded to “not at all” (0), “a little bit” (1), “a fair bit” (2), “a lot (3)”, “unsure (missing = .)”.

	<p>The total score is calculated by summing responses to all 7 items (range: 0 to 21) and was only created for participants with complete data across the items. The distribution of the sample was assessed to define low-medium and high categories. The categories were defined after assessing the centre of the data (histogram), mean =14, median = 17.</p> <p>This was then categorised into three categories: low (0-10), medium community cohesion (11-16) and high community cohesion (17-21).</p>
Tjukurpa	
Cultural knowledge and practice exposure(Q25)	<p>To create the cultural practice, we draw on aacul25_1 to aacul25_10. This instrument was categorised based on early Mayi Kuwayu analysis (Lovett et al. 2019) as the following</p> <ul style="list-style-type: none"> • None (score of 0) • Low (scores 1-10) • Moderate (scores 11 to 20) • High (scores 21 to 30) <p>Recoded to: Low Moderate (0), High (1) None (2) – due to the small number who responded none to all items.</p>
Language (individual)	<p>This uses answers to the question “What is your first language?” and recoded as</p> <ol style="list-style-type: none"> 1. As First language – Aboriginal and Torres Strait Islander Language 2. Other or English
Use language	<p>Question 20 asks do you speak any Aboriginal/Torres Strait Islander words/languages? Responses are No (1), Yes, a little bit (2), Yes, a fair bit (3), Yes a lot (4).</p> <p>Variable was recoded as is No (0) a little bit (1), a fair bit (2) a lot (3).</p>
Cultural responsibilities for country	<p>Derived from the question “Do you have special cultural responsibilities for country?”</p> <p>Multiple option: Yes, mother’s side; Yes father’s side; Yes other country; No</p> <p>Responses was recoded as 1 if they selected any of the yes options (yes, mothers side, yes fathers side, yes other country) or 0 if respondent chose no option. If the participant had selected any of the “yes” options as well as selecting “no”, they are recoded to “no” only.</p>
Ngura	
Lives on country	<p>Derived from the question “do you currently live on your country”. Response options are no (0), yes (1), unsure (2.) These were recoded as: No (0) Yes (1) Unsure (missing).</p>
Time spent living on country	<p>Derived from the question “How much of your life have you spent living on your country?”, Responses include None, a little bit, a fair bit, a lot or all my life, unsure</p> <p>Responses recoded to: No (0), A little bit-a fair bit (1), A lot or all my life (2) Unsure (missing)</p>
Knows tribes (mob’s) country	<p>Q7. Where is your mob’s country/island?</p> <p>Responses were text answer or Unsure</p> <p>Responses coded as: Unsure or missing text answer (0), Responded (1)</p>
Waltja	
Other family speaks language	<p>Q 22. If other family speak language derived from the question, “Who else in our family speaks (spoke) Aboriginal/Torres Strait Islander words or language. Multiple responses including: my partner/spouse, my children, my grandchildren, my parents, my grandparents, my sibling(s), my cousin(s), my aunty(ies) or Uncle(s), other family.</p> <p>Responses were recoded to categories:</p>

	Responses was recoded as 1 if responded selected any of the any option for family (my partner/spouse, my children, my grandchildren, my parents, my grandparents, my sibling(s), my cousin(s), my aunty(ies) or Uncle(s), other family or 0 if respondent chose unsure. Missing was coded as missing.
Skin name (6)	Derived from the question "Do you know your skin name?" Responses are No (1), Yes (2), Unsure (3), Don't have one (4) Responses were collapsed and recode as: Yes (1), No/ Don't have one (0), Unsure (missing)
Knows their mob	Derived from the question "Who are your tribe(s) or mob(s)?" Response options are: free-text answer (coded as "knows mob" = 1) and "Unsure" response (coded as "unsure of mob" = 0) We used the variable amob which has been cleaned by the Mayi Kuwayu Data Management Team in the following way: Participants who wrote a variation of "unsure" (e.g. "don't know", "unknown", "not sure" etc.) are recoded as "unsure of mob". People who did not respond to the free-text and who did not respond to the "unsure" check box are recoded to missing. Responses coded as: Unsure of mob (0), Knows mob (1), Missing (.)
Social determinants	
Household size	The question of household size was derived from Q33. How many people live with you? (number). We cross checked this question with "How many children live with you?" In cases, where the total number of children was greater than the total number of people, we added the totals together. To get the total household size, we added 1 to the total, so as to count the participant (+1). We checked for any anomalies in the data (1 participant recorded 99 people and 99 children). This is likely to be an error, we recoded this as missing. We assessed the spread and centre of the data, mean and SD. We recoded household size as: 1-3 4-6 7-9 ≥10
Number of children	The question of number of children in household, was derived from "How many children live with you?" We assessed the spread of responses – mean and median, histogram. Average was 2.5 children in household that responded. Responses recategorised into: 0"no children" 1 "1-2 child/ren" 2">= 3 children" Missing (.)
Household composition	Household type was derived from the question Q35. Who lives with you? Single response option included Single response: no-one (1,0) Multiple response options include: my partner or spouse, my children, my grandchildren, someone else's children, my parents, my grandparents, my siblings, my cousins, my aunty and uncles. Recode to household type: • Single (coded = 1)

	<ul style="list-style-type: none"> • No-one AND responded “0” Q33 How many people live with you?” 0 • No-one AND did not respond to Q33 • Multigenerational (coded = 2) <ul style="list-style-type: none"> • Those who selected lives with grandparent and/or grandchildren • Living with parents and living with my children or spouse • Lives with parents and someone else’s kids • Lives with aunty/uncle and living with someone else’s kids • Extended (coded = 3) <ul style="list-style-type: none"> • Lives with siblings, cousins, aunties/uncles, other family (in-laws), someone else’s children • Nuclear (coded = 4) <ul style="list-style-type: none"> • Only those who selected partner and children • Friends or visitors (coded = 5) <ul style="list-style-type: none"> • If selected “other friends or visitors” • Partner only (coded=6) <ul style="list-style-type: none"> • Only those who selected partner and no other response • Single parent household (coded = 7) <ul style="list-style-type: none"> • Only those who selected lives with children or someone else’s children • Lives with parents (coded = 8) <ul style="list-style-type: none"> ○ If selected “My parents” and has not selected “My children” <p>These categories were used in the descriptive analysis, and collapsed further in the models to:</p> <p>1 “Nuclear/Partner only” 2 “Multigenerational and extended families” 3 “Other”</p> <p>Other includes single, single parent, other friends or visitors</p>
Employment	Participants were categorised as employed if they reported working or studying part or full-time, and categorised as not employed if they were not working (including being retired, on a pension or carer). Participants are categorised as missing if they have “not selected” for all ababo41* items.
Education	Highest attained education qualification was categorised into three groups: Year 10 or below (no school, primary school and intermediate certificate); Year 12 or trade or certificate (higher school, diploma/certificate, trade); and, university qualifications.
Welfare recipient	Derived from “Do you receive welfare payments?” No (0), yes (1), unsure (2). Unsure coded as missing (2=).
Worries in the family (Q101)	<p>The question asked “in the last year, has anyone in your close family: been badly hurt or sick, passed away, lost a job, had problems at work, had an alcohol or drug problem, experienced violence, had stuff stolen, been arrested or been in youth detention or prison, had a relationship break up, had children taken away”. Response yes, no, not relevant. Recoded “not relevant” as no.</p> <p>A total score for “Worries in the family” was created by summing the total responses to this question. No/Not relevant (0), Yes (1). Totals were only created for participants who responded to all questions.</p> <p>Recategorised into 3 categories No worries (0) Few worries (1-3). More worries (4-10).</p>
Worries in the community (Q102)	<p>The question asked “Are any of these a problem where you live – drinking too much grog; tobacco smoking; drugs; sniffing; racism; gambling; family violence; people fighting or not getting along; humbugging;” Options included not at all (1), a little bit (2), a fair bit (3), a lot (4).</p> <p>Composite variable will be created that adds together the answers. (0 – not at all, unsure. 1 (a little), (a fair bit) (a lot).</p>

	<p>A total score for “Worries in the community” was created by summing the total responses to the question. Totals were only created for participants who responded to all questions. We reviewed the distribution of the data. 3 categories were created No worries (0) Few worries (1-17). More worries (18-27).</p>
--	--

Supplementary Table 3. Sensitivity of family functioning and cultural determinant associations to different approaches in calculating the family functioning measure (FFM)

	FFM with imputed values		FFM with no imputation aPR	
<i>Kanyini</i>				
Community cohesion	aPR (95% CI)	p value	aPR (95% CI)	p value
Low	1 (ref)		1 (ref)	
Moderate	2.07 (1.28-3.36)	0.003	2.01 (1.22-3.30)	0.006
High	2.80 (1.76-4.45)		2.65 (1.64-4.29)	<0.001
Individual agency in the community				
Low	1 (ref)		1 (ref)	
Moderate	1.69 (1.25-2.30)	0.001	1.76 (1.27-2.44)	0.001
High	2.16 (1.63-2.87)	<0.001	2.28 (1.68-3.09)	<0.001
<i>Tjukurpa</i>				
Exposure to cultural practice and knowledge				
Low-Moderate	1 (ref)		1 (ref)	
High	1.44 (1.26-1.64)	<0.001	1.48 (1.29-1.70)	<0.001
None	1.03 (0.64-1.64)	0.903	0.90 (0.50-1.60)	0.711
First language				
English or other	1 (ref)		1 (ref)	
An Aboriginal language	1.22 (1.07-1.41)	0.004	1.18 (1.02-1.36)	0.024
Speaks language				
No	1 (ref)		1 (ref)	
A little bit	1.03 (0.82-1.30)	0.807	1.08 (0.84-1.39)	0.525
A fair bit	0.93 (0.67-1.28)	0.652	1.01 (0.72-1.41)	0.970
A lot	1.31 (1.08-1.60)	0.007	1.37 (1.10-1.70)	0.004
<i>Ngura</i>				
Cultural responsibilities for Country				
No	1 (ref)		1 (ref)	
Yes	1.12 (0.97-1.30)	0.111	1.22 (1.03-1.43)	0.015
Currently lives on country				
No	1 (ref)		1 (ref)	
Yes	1.11 (0.98-1.25)	0.109	1.06 (0.94-1.21)	0.342
Time in life spent living on Country				
None	1 (ref)		1 (ref)	
A little bit - a fair bit	0.87 (0.71-1.08)	0.219	0.95 (0.75-1.19)	0.638
A lot/All my life	1.10 (0.92-1.31)	0.320	1.14 (0.93-1.40)	0.193
Knows tribe's (mob's) country				
Unsure	1 (ref)		1 (ref)	
Reported	1.11 (0.89-1.38)	0.351	1.05 (0.84-1.32)	0.676
<i>Waljta</i>				
Other family speaks language				
No	1 (ref)		1 (ref)	

Yes, other family speak language	1.10 (0.87-1.38)	0.432	1.20 (0.93-1.53)	0.162
Knows skin name				
No/don't have one	1 (ref)		1 (ref)	
Yes	0.99 (0.81-1.20)	0.890	1.08 (0.87-1.34)	0.484
Knows their mob				
Unsure	1 (ref)		1 (ref)	
Know mob	0.89 (0.74-1.07)	0.216	0.87 (0.72-1.04)	0.127